

STATE OF ALASKA

Jay S. Hammond, Governor

Annual Performance Report for

EVALUATION OF INTERIOR ALASKA WATERS AND
SPORT FISH WITH EMPHASIS ON
MANAGED WATERS - DELTA DISTRICT

by

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RESEARCH PROJECT SEGMENT

State: ALASKA Name: Lake and Stream Investigations
Project No.: F-9-13
Study No.: G-III Study Title: Lake and Stream Investigations
Job No.: G-III-I Job Title: Evaluation of Interior Alaska
Waters and Sport Fish with
Emphasis on Managed Waters -
Delta District

Cooperator: Richard Peckham

Period Covered: July 1, 1980 to June 30, 1981

ABSTRACT

Fourteen lakes stocked with rainbow trout, Salmo gairdneri Richardson and coho salmon, Oncorhynchus kisutch (Walbaum), were sampled with gill nets, and data on survival and growth are presented. Population estimates of Talarik Creek strain rainbow trout stocked in three lakes revealed survival to Age I ranging from 7 percent to 23 percent. Two of the lakes with the lowest survival contained a remnant population of Age VI rainbow trout from prior stocking.

Age I rainbow trout of the Swanson River strain were caught in Quartz Lake at a greater frequency with fyke nets than Age I coho salmon, although gill net samples were comprised of 96 percent coho salmon. The stocking rate for coho salmon was nearly five times as great.

Gill net catch rates for Age I Talarik rainbow trout were consistently higher than in lakes stocked in prior years with rainbow trout of other strains at similar densities.

Growth of Talarik Creek rainbow trout appears comparable with other strains stocked in prior years, with mean lengths ranging from 216 millimeters to 246 millimeters in three study lakes after 11.5 months of lake residency.

Estimates of angler use and sport harvest were made on Quartz Lake for winter and summer fisheries. Estimated pressure for the winter season from January 1 to March 31, 1980 was 6,028 angler-hours. Total estimated harvest for the period was 3,135 coho salmon and 60 rainbow trout. The pressure estimate for the summer season was 27,012 angler hours and the estimated harvest was 25,121 coho salmon and 81 rainbow trout.

A comparison of on-site pressure and harvest estimates with postal harvest surveys for Quartz and George Lakes, as well as creel census summaries, is presented.

Two study sections in the lower Goodpaster River were sampled by electro-fishing in late June 1980 to determine population levels of Arctic grayling, Thymallus arcticus (Pallas). Age, length and species composition data were also collected. The Petersen population estimate was 512 grayling per kilometer (819 grayling per mile). Age Class IV grayling were predominant, comprising 42% of the sample. Capture rate and relative abundance of all species captured in the Goodpaster River is presented.

A preliminary fishery survey was conducted on the Ladue River in cooperation with U.S. Bureau of Land Management personnel. A description of the river, flow measurements and fish sampling results are presented. Fish captured in order of abundance were Arctic grayling, longnose sucker, Catostomus catostomus (Forster), northern pike, Esox lucius Linnaeus, and round whitefish, Prosopium cylindraceum (Pallas).

BACKGROUND

The recreational fisheries locations in the upper Tanana River drainage generally fall into three categories: streams, lakes with indigenous fish species and stocked lakes. Table 1 lists common and scientific names of all fish species mentioned in this report.

The principal fish species of recreational importance in area streams are Arctic grayling and round whitefish. Burbot are widely distributed in the larger glacial rivers and near the confluences of many tributary streams.

Lakes at lower elevations (generally below 2,200 ft) that connect to a river system usually contain populations of northern pike, burbot, least cisco, and humpback whitefish. Lakes at higher elevations support populations of lake trout, grayling, round whitefish and burbot.

Landlocked lakes are typically barren. Since statehood most lakes near the highway system have been surveyed and several that were found to contain undesirable fish populations have been chemically rehabilitated. Many capable of supporting fish have been stocked with rainbow trout or coho salmon. A few have been stocked with Arctic grayling. Various stocking rates, sizes, strains, and timing have been tested to determine those which provide optimum survival and growth of stocked fish.

Research and management of selected waters are directed toward monitoring fish population levels and angler utilization. The locations of waters within the study area are shown in Figure 1.

RECOMMENDATIONS

1. Evaluation of survival and growth of stocked rainbow trout, coho salmon, and grayling in selected waters should continue with emphasis on evaluating rainbow trout from the Swanson River and Talarik Creek sources stocked in 1980.

Table 1. List of common names, scientific names and abbreviations.

Common Name	Scientific Name & Author	Abbreviation
Arctic grayling	<u>Thymallus arcticus</u> (Pallas)	GR
Arctic lamprey	<u>Lampetra japonica</u> (Martens)	AL
Burbot	<u>Lota lota</u> (Linnaeus)	BB
Coho salmon	<u>Oncorhynchus kistuch</u> (Walbaum)	SS
Humpback whitefish	<u>Coregonus pidschian</u> (Gmelin)	HWF
Inconnu (Sheefish)	<u>Stenodus leucichthys</u> (Güldenstadt)	SF
Lake chub	<u>Couesius plumbeus</u> (Agassiz)	LC
Lake trout	<u>Salvelinus namaycush</u> (Walbaum)	LT
Least cisco	<u>Coregonus sardinella</u> Valenciennes	LCI
Longnose sucker	<u>Catostomus catostomus</u> (Forster)	LNS
Northern pike	<u>Esox lucius</u> Linnaeus	NP
Rainbow trout	<u>Salmo gairdneri</u> Richardson	RT
Round whitefish	<u>Prosopium cylindraceum</u> (Pallas)	RWF
Sheefish	<u>Stenodus levcichthys</u> (Guldenstadt)	SF
Slimy sculpin	<u>Cottus cognatus</u> Richardson	SSC

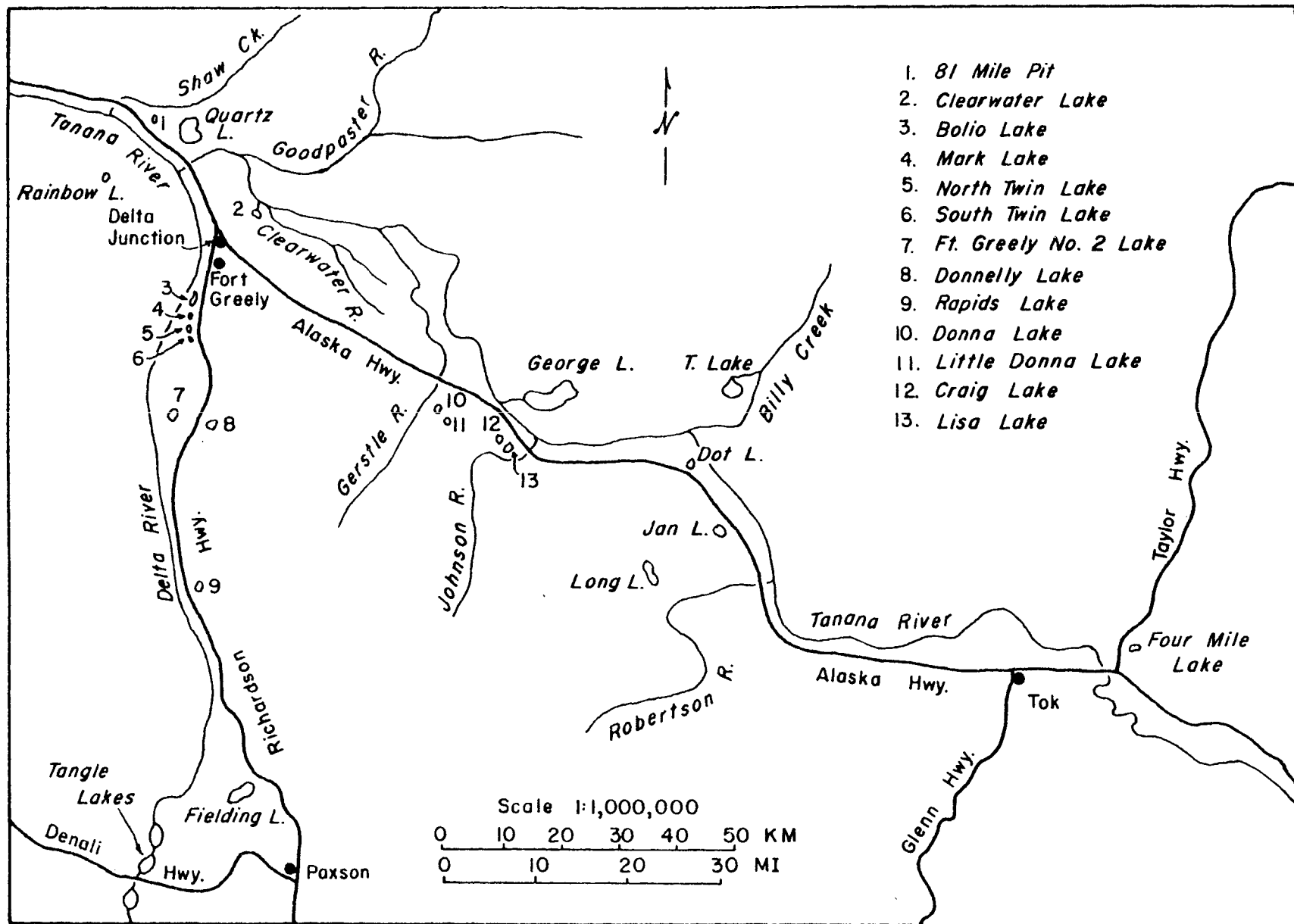


Figure 1. Location of waters in the Delta District.

2. Angler effort and sport fish harvest estimates on Quartz and George Lakes should continue.
3. Efforts to determine winter distribution of grayling in the Tanana drainage should be expanded.
4. Efforts should continue to secure public access sites along the Tanana River between Delta and Tok to provide launching sites and riverboat access to waters in the area.
5. Expanding agricultural development and other changing land uses in the Delta area should be closely monitored to provide maximum protection to fishery resources and habitat.
6. Small headwater tributaries of the Goodpaster River should be surveyed to determine summer utilization by juvenile or subadult grayling.

OBJECTIVES

1. To evaluate stocking policies for rainbow trout and coho salmon and formulate stocking recommendations for optimum survival and growth.
2. To monitor existing fish stocks in the Goodpaster River to determine changes in population structure.
3. To obtain estimates of existing or potential angler use and sport fish harvest on Quartz Lake, George Lake, and other high use waters.
4. To assist as required in the investigation of public access status to the area's recreational fishery waters.

TECHNIQUES USED

A boat-mounted electrofishing unit described by Van Hulle (1968) was used to capture fish for population studies in the Goodpaster River.

Fish population sampling in stocked lakes and the Ladue River utilized seines, fyke nets and gill nets. Seines were 50 x 8 ft in measurement with 3/8 sq in mesh of knotless nylon. Fyke nets were New Hampshire and South Dakota style nets measuring 15 to 18 ft in length by 2 to 4 ft in diameter with 3/8 in sq knotless nylon webbing and with 4 ft deep center leads from 25 to 50 ft in length. Gill nets were graduated mesh monofilament, 125 ft x 6 ft sinking nets with five mesh sizes ranging from 1/2 in to 2 1/2 in bar measure.

Fish in the Ladue River were also sampled with a Coffelt Model BP-3 back-pack dc shocker.

Fish were measured to fork length in millimeters. Grayling scales used for age determination were cleaned, mounted on gummed cards, then impressed on 20 mil acetate using a Carver press at 20,000 psi heated to 200°F for 30 sec and read along their dorsal radius on a 3M Consultant 114 Microfiche reader. Rainbow trout and coho salmon scales were cleaned, mounted between glass slides and read using a Bausch and Lomb micro-projecter.

Population estimates of fish in stocked lakes and the Goodpaster River were based on a ratio of marked to unmarked fish in the sample using the Petersen equation described by Ricker (1958).

Water samples were collected using a Kemmerer water sampler, and chemical analysis was done with a Hach model AL-36-B kit.

Small fish sampled for growth and condition were weighed to the nearest 0.1 gram on a triple beam balance. Larger fish were weighed on a Chatillon IN-6 or IN-25 spring scale.

FINDINGS

Fish Stocking Evaluations

Fish population sampling was conducted on 14 lakes stocked with rainbow trout and coho salmon for growth and survival evaluation of stocked fish. Four Mile Lake was sampled in June, while the others were sampled in late summer from August 21 to August 28. Most lakes were sampled with two gill nets fished overnight for 18 to 29 hours. Quartz Lake was sampled with four gill nets, while Fort Greely #2 and Robertson #2 Lakes were netted with one gill net. Netting results, population characteristics and stocking histories are summarized in Table 2.

Major emphasis was placed on assessing growth and survival of rainbow trout stocked in four lakes and coho salmon stocked in two lakes in 1979; however, sampling results in several lakes with older age classes of fish are noteworthy.

Eleven Age IV coho salmon were netted in Donna Lake at a frequency of 0.28 fish/ net-hour. Only three of the fish (two males and one female) were mature. The relatively high stocking rate (398 fish/acre) and apparent high survival resulted in slower than normal growth and delayed maturity. The mean length of the sample was 238 mm.

Survival of coho salmon to Age IV in the study lakes is uncommon, having been noted in only two other lakes in previous years.

Age II coho salmon from the Seward Lagoon source were sampled in Donnelly, Lisa, Mark, North Twin and South Twin lakes. These fish had mean lengths ranging from 226-357 mm, with an average of 273 mm. Coho salmon stocked in North Twin Lake at a rate of 261 fish/acre showed exceptional growth to Age II, ranging from 275-470 mm and had a mean length of 357 mm.

Table 2. Population characteristics of stocked lakes determined by graduated mesh gill nets, Interior Alaska, 1980.

Lake	Date Sampled	Species	No.	Age Class	Length (mm)		Frequency*	Date Stocked	Total No.	No. /lb.	No. /acre	Source
					Range	Mean						
Donna	8/27	SS	11	IV	222-264	238	0.28	8/24/76	23,100	174	398	Bear Lake
Little Donna	8/27	RT	4	VI	466-555	510	0.10	7/23/74	16,300	279	347	Winthrop
		RT	26	I	210-256	232	0.63	9/18/79	3,550	203	76	Talarik
Donnelly	8/26	SS	18	II	180-250	226	0.50	8/15/78	10,078	145	155	Seward Lagoon
		SS	9	0	98-112	107	0.25	5/27/80	9,984	216	154	Ship Cr.
Ft. Greely #2	8/21	RT	2	VI	324-356	340	0.08	7/10/74	10,000	588	1,250	Winthrop
Jan	8/28	SS	97	I	199-232	216	2.43	9/18/79	4,010	54	91	Seward
Lisa	8/28	SS	46	II	225-274	253	0.94	8/15/78	15,000	145	300	Seward Lagoon
Mark	8/21	SS	4	II	261-282	274	0.07	8/15/78	4,000	68	200	Seward Lagoon
North Twin	8/21	SS	9	II	275-470	357	0.16	8/15/78	6,000	145	261	Seward Lagoon
South Twin	8/21	SS	13	II	235-300	257	0.22	8/15/78	6,000	145	286	Seward Lagoon
		SS	33	0	97-115	104	0.56	5/27/80	4,990	217	238	Ship Cr.
Quartz	8/27	RT	1	III	450		0.01	7/26/77	113,800	11-304	76	Alaska Ennis
		RT	8	I	193-240	219	0.09	9/13/79	32,858	238	22	Swanson River
		SS	1	III	404		0.01	6/28-8/15/77	197,400	170-394	132	Seward Lagoon
		SS	162	I	185-235	211	1.85	9/21/79	150,095	57	100	Seward
Rainbow	8/28	RT	1	VI	585		0.02	6/26-7/10/74	39,000	588-1017	390	Winthrop
		RT	30	I	204-290	246	0.73	9/18/79	10,000	203	100	Talarik
Rapids	8/21	RT	1	VI	410		0.02	7/23/74	2,000	279	400	Winthrop
		RT	2	III	280-344	312	0.05	Natural Reproduction				
		RT	16	I	165-215	193	0.36	Natural Reproduction				
Robertson #2	8/28	RT	22	I	203-232	216	1.22	9/18/79	2,450	203	306	Talarik
4-Mile	6/1	RT	11	III	314-356	331		6/14/77	24,800	95	248	Winthrop

* Fish per net hour - 125 ft graduated mesh gill net

No age II coho salmon were captured in four gill nets fished for 88 total net-hours in Quartz Lake on August 27, although 162 Age I and one Age III cohos were netted. The probable reason for no Age II fish being captured is the initial low rate of stocking (55,500 or, 37 fish/acre) and the high rate of angler exploitation in both summer and winter fisheries from about July 1979 to July 1980 for that age class. This is discussed further under the section on angler harvest.

Age VI rainbow trout were netted in three lakes, Little Donna, Fort Greely #2 and Rainbow. All were of the Winthrop, Washington strain. The largest was 585 mm and weighed 2.6 kg (5.75 pounds).

Although the largest rainbow trout netted from Quartz Lake in 1980 was 450 mm in length, several larger rainbow trout were caught by anglers. Verified lengths and weights on three caught in late summer ranged from 597-673 mm in length and 3.75-4.43 kg (8.26-9.75 lbs) in weight. The largest of these fish was an Age IV rainbow trout of the Oregon strain.

Natural recruitment of rainbow trout was again documented in Rapids Lake. Sixteen Age I and two Age III rainbow trout, having mean lengths of 193 mm and 312 mm, respectively, were netted. A total of 500 Talarik rainbow trout at a size of 413 fish per pound were stocked in late July 1980. The most recent plant prior to that was in 1975. The lake, located in mountainous terrain, has no visible inlet, but a small outlet flows about 30 m before entering Falls Creek. Falls Creek has a constant summer flow of clear water and a gravel substrate, providing suitable spawning habitat. It is suspected, however, that spawning occurs in the outlet or spring seeps along the shoreline.

Survival Estimates:

Population estimates were made on Age I Talarik Creek strain rainbow trout in three lakes during 1980. Little Donna, Rainbow and Robertson #2 Lakes range in size from 8-100 surface acres. Using a modified Petersen mark and recapture method, population estimates in the three lakes ranged from 7 to 23% (Table 3). The fish were stocked in each of the three lakes on September 18, 1979.

Little Donna Lake

During a 3-day period from June 18-20, 400 Age I Talarik rainbow trout were captured using fyke nets and a bag seine. Approximately equal numbers were captured by each method. A fin was clipped and the fish were released back into the lake.

On July 2, after 11 days to allow for random mixing of the marked fish in the population, 41 trout were captured in fyke nets, of which 26 were marked recaptures. The modified Petersen estimate is 622 or 18% of 3,550 fish stocked on September 18, 1979, at a rate of 76 fish per acre.

On August 27, 1980, Little Donna Lake was gill netted. Of 26 Age I trout captured, 22 were marked recaptures. Assuming no mortality of the fish

Table 3. Survival estimates for Age I Talarik rainbow trout, summer, 1980.

Lake	Surface Acres	Marked fish in population (m)	Fish Examined (c)	Recaptures (r)	Petersen Estimate (n)*	Date of Estimate	Percent Survival	Date Stocked	Total No.	No. /lb.	No. /acre
Little Donna	47	400	41	26	622	7/2/80	18	9/18/79	3,550	203	76
Rainbow	100	113	30	4	701	8/28/80	7	9/18/79	10,000	203	100
Robertson #2	8	242	89	38	558	7/11/80	23	9/18/79	2,450	203	306

* $M = \frac{(m)(c+1)}{(r+1)}$

originally marked, the modified Petersen estimate based on this capture is 469, or 13% survival.

A known mortality of 52 fish occurred during the June sampling, which if added to the population estimate, would raise the first survival estimate to 19%. Most of the observed mortality apparently was the result of predation by grebes. Of 78 trout caught in one fyke net on June 18, 42 were found dead in the net. Most were scaleless and many had obvious parallel contusions, apparently inflicted by a bird's bill. A pair of grebes was sighted on this 47 acre lake. An unknown number of the fish trapped may have been consumed. The extent of bird-related predation on unconfined fish in the lake, of course, is unknown, but over the period of several summer months is probably significant.

Other predation in this population was likely caused by a remnant number of Age VI rainbow trout. One was captured in a fyke net in June and four, having a length range from 466-555 mm and a mean of 510 mm, were captured in gill nets in August. No fish were found in stomach contents; however, most of the predation probably occurs in the first few months after stocking.

Rainbow Lake

On August 7 and 8, a total of 108 rainbow trout was captured with a bag seine and five were caught in fyke nets. The 113 fish were marked with a fin clip and released. On August 28 the lake was sampled with gill nets and 30 Age I trout were captured, of which 4 were marked recaptures. The modified Petersen estimate of 701 fish represents a 7% survival from 10,000 Talarik rainbow trout stocked in September 1979 at 100/acre.

A small number of Age VI rainbow trout are also present in this 100 acre lake. One trout measuring 585 mm and weighing 2.6 kg (5.75 lbs) was gill netted on August 28.

Robertson #2 Lake

On July 3 and 4, 242 trout captured by fyke nets and bag seine were given a fin clip and released. Only three of the total were captured by seining due to the steep shoreline and muck bottom.

On July 11, 38 of 89 fish captured in fyke nets in this 8-acre lake were marked recaptures. The modified Petersen estimate of the population on that date was 558 fish, or 23% survival, from 2,450 fish stocked at 306 per surface acre.

Of 15 fish examined from a gill net sample on August 28, five were marked recaptures. Assuming no mortality of the marked fish, the population estimate on this date was 645, or 26% survival, of the stocked fish. Two possible factors contributing to the higher survival in this lake are the absence of any predator fish in the population and the brownish stain of the water in this bog-type lake, which would likely lessen the effectiveness of predatory animals.

Although dissolved oxygen levels as low as 1.6 ppm have been recorded in prior years, oxygen levels during the 1979-80 winter remained relatively high. On December 29, 1979, dissolved oxygen at the surface and at 2 meters depth was 8.0 and 6.0 ppm, respectively. Again on March 19, 1980, surface dissolved oxygen was recorded at 6.0 ppm, while at 2 meters the reading was 4.0 ppm. The maximum depth of the lake is 4 meters (13 feet).

Quartz Lake

A total of 32,858 Swanson River strain rainbow trout was stocked in Quartz Lake on September 13, 1979. In addition, 150,095 coho salmon were stocked on September 21, 1979. The coho salmon were stocked at a size and density of 57 per pound and 100 per acre, as compared to 283 per pound and 22 per acre for the rainbow trout.

Although no population estimates were made on this 1,500 acre lake, it was sampled periodically during the summer to determine relative abundance and growth of the stocked fish.

Rainbow trout outnumbered coho salmon in fyke net samples on May 16 and July 31, but the coho salmon catch in gill nets on August 27 was much greater. Table 4 shows comparative catch rates of rainbow trout and coho salmon in Quartz Lake during the summer. On May 16 rainbow trout comprised 83% of the fyke net catch, with a frequency of 1.44 fish per hour, while coho salmon comprised 17% of the catch and were netted at a rate of 0.29 fish per hour. On July 31, the fyke net catch was comprised of 55% rainbow trout and 45% coho salmon. However, the gill net catch of Age I fish on August 27 contained 95% coho salmon and only 5% rainbow trout. Catch rates were 1.85 and 0.09 fish per hour, respectively.

It should be remembered that the initial stocking rate for the coho salmon was nearly five times as great as that for the rainbow trout.

The higher fyke net catches suggest a greater survival of the Swanson River rainbow trout than indicated by gill net catches.

Gill net catches of Talarik Creek rainbow trout in Little Donna, Rainbow and Robertson #2 Lakes were 0.63, 0.73 and 1.22 fish per hour, respectively (Table 2). But again, stocking rates were higher in all of these lakes than for Swanson River trout stocked in Quartz Lake.

Havens (1980) reported consistently higher gill net catches of Swanson trout than Talarik trout in lakes stocked with both strains in the Upper Cook Inlet Drainage. Catch rates for Swanson trout averaged 2.30 fish per hour, while Talarik trout averaged 0.91 fish per hour.

A comparison of capture rates of Age I rainbow trout stocked in the study lakes since 1972 is shown in Table 5. Since 1974 only one lake had a higher catch rate than the Age I Talarik trout netted in the three lakes in 1980. Winthrop rainbows were caught in Four Mile Lake at a rate of 0.72 fish/hr in 1978. The catch rate of 0.61 in North Twin Lake in 1976 was the next highest, but this was a rehabilitated lake stocked at a much higher

Table 4. Comparative catch rates of rainbow trout and coho salmon
in Quartz Lake, summer, 1980.

Date	Sample Gear	Rainbow Trout			Coho Salmon		
		No. Caught	Percent	Freq.*	No. Caught	Percent	Freq.*
5/16/80	fyke net	69	83	1.44	14	17	0.29
7/31/80	fyke net	53	55	0.55	44	45	0.46
8/27/80	gill net	8	4	0.09	162	96	1.85

* Fish captured per net hour

Table 5. Comparisons of capture rates, growth and stocking data for various strains of Age I rainbow trout in Interior Alaska, 1972-1980.

Lake	Date Sampled	No. Captured	Length (mm)		Freq.*	Date Stocked	Total No.	No. /lb.	No. /acre	Source
			Range	Mean						
Little Donna	8/27/80	26	210-256	232	0.63	9/18/79	3,550	203	76	Talarik
Rainbow	8/28/80	30	204-290	246	0.73	9/18/79	10,000	203	100	Talarik
Robertson #2	8/28/80	22	203-232	216	1.22**	9/18/79	2,450	203	306	Talarik
Quartz	8/27/80	8	193-240	219	0.09	9/13/79	32,858	283	22	Swanson
Quartz	9/26/78	1	264		0.01	7/26/77	113,800	11-304	76	Alaska Ennis
Four Mile	9/14/78	23	236-292	268	0.72	6/17/77	24,800	95	248	Winthrop
Jan	9/16/77	5	262-312	295	0.10	8/2/76	10,000	670	227	Oregon
Lisa	9/16/77	1	230		0.02	8/2/76	10,000	670	200	Oregon
Quartz	9/13/77	2	300-304	302	0.04	8/3-24/76	97,800	100-670	65	Oregon
Quartz	9/8/76	2	274-289	282	0.05	7/24/75	210,000	171-186	140	Ennis
North Twin	8/18/76	29	194-284	229	0.61**	7/24/75	15,000	171	652	Ennis
Little Donna	8/14/75	1	280		0.03	7/23/74	16,300	279	347	Winthrop
Quartz	10/8/75	16	225-310	275	0.33	7/10-8/28/74	184,600	119-588	123	Winthrop
Quartz	11/14/74	22	323		0.52	8/1-8/15/73	285,100	98-105	190	Winthrop
Mark	6/15/73	24	83-110	101	0.30	9/12/72	7,500	147	375	Winthrop

Table 5. (Cont'd.) Comparisons of capture rates, growth and stocking data for various strains of Age I rainbow trout in Interior Alaska, 1972-1980.

Lake	Date Sampled	No. Captured	Length (mm)		Freq.*	Date Stocked	Total No.	No. /lb.	No. /acre	Source
			Range	Mean						
Quartz	8/8/73	71	269-391	335	1.97**	6/23-7/26/72	306,800	106-163	204	Ennis
Donna	7/12/72	30	91-227	134	0.79	6/22/71	50,000	262-357	862	Ennis
Little Donna	7/11/72	59	212-318	239	1.28	6/22/71	15,000	262	319	Ennis
Jan	8/3/72	42	194-251	218	1.40	6/24/71	19,400	228	441	Ennis
Lisa	7/18/72	29	216-317	268	0.60	6/24/71	39,500	374	790	Ennis
Mark	6/28/72	68	104-244	138	1.70	6/22/71	10,000	262	500	Ennis
Robertson #2	7/20/72	24	201-300	245	1.04**	6/24/71	3,100	228	388	Ennis
Rainbow	9/20/72	71	214-380	333	1.69**	7/22/71	59,100	666	616	Winthrop

* Fish per net hour - 125 ft graduated mesh gill net

** Denotes lakes which contained no predator fish at time of stocking.

density of 652 fish/acre. Four Mile Lake, stocked at 248 fish/acre, contained a moderate population of adult sheefish at the time.

The highest catch rate of Age I rainbow trout recorded on any of the study lakes since 1972 was 1.97 fish/hr in Quartz Lake in 1973. These were Ennis rainbow trout stocked at 204 fish/acre in the recently rehabilitated lake.

High catch rates, ranging from 0.79-1.70 fish/hr and averaging 1.21 fish/hr, were recorded in seven lakes netted in 1972. Stocking rates were also much higher than in recent years, ranging from 319-862 fish/acre and averaging 559 fish/acre. Six of these lakes shown in Table 5 were stocked with Ennis trout and one with Winthrop.

Growth and Condition:

Growth comparisons with trout stocked in prior years are difficult because of the variables of stocking densities, time of stocking, time of sampling and individual lake fertilities. However, observed growth of the Talarik rainbow trout appears comparable with other strains stocked in prior years (except in Quartz Lake which has a very high morphoedaphic index of 35) if equivalent periods of lake residency are considered. After about a year of lake residency, Talarik rainbows stocked in Little Donna, Rainbow and Robertson Lakes had mean lengths of 232 mm, 246 mm and 216 mm, respectively.

Swanson trout stocked in Quartz Lake appeared to have a slower growth rate than other trout strains previously stocked. They had a mean length of 219 mm after a year of lake residency. Although sample size was small most years, mean length of Age I rainbow trout of other strains sampled from Quartz Lake for six prior years averaged 297 mm for 13 to 14 months of lake residency. Growth comparisons are shown in Table 5.

Havens (1979) found that Talarik and Swanson strain rainbow trout stocked in Upper Cook Inlet Drainage lakes were smaller at Age I than Ennis strain rainbows. From 1974 through 1979, combined average lengths for Age I Ennis, Talarik and Swanson rainbows were 234 mm, 197 mm and 193 mm, respectively.

Comparisons of growth and condition for Age I rainbow trout from the Talarik and Swanson strains and Age I coho salmon from the Seward strain sampled in 1980 are presented in Table 6.

A comparison of rainbow trout and coho salmon stocked in Quartz Lake in September, 1979, shows the rainbow trout growing faster during their first summer than coho salmon. Rainbow trout of the Swanson strain sampled on May 16 had a mean length of 83 mm, while Seward coho salmon were 131 mm in mean length; the coho salmon had been stocked at a larger size of 57/lb as compared to 283/lb for the rainbow trout. When sampled again on July 31 the rainbow trout had increased 71 mm in mean length to 154 mm, while the coho salmon had a mean length increase of 55 mm to 186 mm. By August 27 the mean length of rainbow trout sampled was 219 mm, exceeding the coho salmon which averaged 211 mm. Thus, rainbow trout increased 65 mm in mean

Table 6. Growth and condition comparisons for Age I rainbow trout and coho salmon in Interior Alaska Lakes, summer, 1980.

Lake	Date Sampled	No.*	Species	Strain	Length (mm)		Weight (gms)		K**
					Range	Mean	Range	Mean	
Little Donna	6-18	18	RT	Talarik	100-140	124			
	7-2	41	RT	Talarik	92-156	121	8.4-42.4	20.4	1.15
	8-27	26	RT	Talarik	210-256	232	109.0-213.0	153.9	1.23
Quartz	5-16	17	RT	Swanson	73-97	83	3.7-8.7	5.9	1.03
	7-31	23	RT	Swanson	105-211	154	14.0-107.0	45.6	1.25
	8-27	8	RT	Swanson	193-240	219			
Quartz	5-16	8	SS	Seward	110-160	131	13.5-42.6	24.8	1.10
	7-31	19	SS	Seward	145-195	186	42.2-91.2	77.1	1.20
	8-27	162	SS	Seward	185-235	211			
Rainbow	8-7&8	30	RT	Talarik	111-246	185	13.6-236.1	95.3	1.51
	8-28	30	RT	Talarik	204-290	246		190.7	1.28
Robertson #2	7-3	31	RT	Talarik	97-180	142	10.1-76.2	41.2	1.44
	8-28	22	RT	Talarik	203-232	216	95.3-145.3	113.5	1.13
Jan	8-28	97	SS	Seward	199-232	216	99.9-140.7	122.6	1.22

* Number of fish shown is not necessarily the total number captured. In some instances only a sample was measured from the total captured.

** K= Condition Factor = $\frac{\text{Weight}_3}{\text{Length}^3} \times 10^5$

length as compared to an increase of 25 mm for the coho salmon in one month.

Age I coho salmon sampled in Jan Lake had a mean length of 216 mm as compared to 211 mm for those in Quartz Lake. Stocking size and rates were similar, as shown in Table 2.

Angler Pressure and Sport Fish Harvest Estimates

Quartz Lake:

Quartz is a 1,500 acre lake located near the Richardson Highway, approximately 16 miles north of Delta Junction. The lake was rehabilitated in 1970 with powdered rotenone to eliminate stunted northern pike and least cisco. Rainbow trout have been stocked annually since rehabilitation, except in 1978 when no fish were available. Coho salmon were stocked in 1977, 1978 and 1979.

Two separate pressure and harvest estimates were made. One covered part of the winter fishery from January 1 to March 31, and one covered the summer fishery from May 10, immediately after breakup, to August 31. Observations after Labor Day weekend revealed some fishing occurring up to freeze-up, which usually occurs in early October. While fishing success is good during September, pressure probably accounts for less than 5% of the total fishing effort for the open-water season.

The winter census covered approximately 50% of the ice fishing season, which usually lasts from early November through April.

A stratified random sampling schedule was used to determine angling pressure from January 1 through March 31, 1980. The schedule involved four hourly counts on 2 weekdays and 1 weekend day or holiday per week. The hours covered prior to March 1 were 9 a.m.-4 p.m. With lengthening daylight, hours covered after March 1 were 8 a.m.-6 p.m.

The pressure estimate for the three months of the winter fishery covered was 6,028 angler hours (Table 7). An estimated 64% of the total pressure occurred on weekends and holidays.

Catch success determined from angler interviews is shown in Table 8. Completed trips accounted for only about 15% of the total 434 hours fished by 181 anglers contacted. However, anglers with completed trips accounted for 42% of the recorded harvest. Totals of 225 coho salmon and 4 rainbow trout were harvested (both complete and incomplete trips) at catch rates of 0.52 and 0.01 fish/hr, respectively. The catch rate for completed trips was 1.47 fish/hr.

The expanded total harvest based on pressure and catch rate estimates was 3,135 coho salmon and 60 rainbow trout.

Most of the harvest consisted of coho salmon forming their third-winter annuli, from the 1977 stocking of 197,400 fish. A small percentage of the

Table 7. Quartz Lake angler pressure estimates, January 1 - March 31, 1980.

Month	Weekdays		Weekends and Holidays		Total
	Estimated Angler Hours	Percent of Total	Estimated Angler Hours	Percent of Total	
Jan. 1 - Feb. 29 (9 a.m. - 4 p.m.)	1,546	39	2,462	61	4,008
March 1 - March 31 (8 a.m. - 6 p.m.)	601	30	1,419	70	2,020
Totals	2,147	36	3,881	64	6,028

Table 8. Quartz Lake creel census summary, January 1 to March 31, 1980.

Month	Anglers	Total Hrs Fished	Total SS Kept	Total SS Caught	Total RT Kept	Fish per hour*			Hours per Angler
						SS	RT	Total	
Jan	77	197	150	151	3	0.76	0.02	0.78	2.6
Feb	66	149	40	40	0	0.27		0.27	2.3
March	<u>38</u>	<u>88</u>	<u>35</u>	<u>35</u>	<u>1</u>	<u>0.40</u>	<u>0.01</u>	<u>0.41</u>	<u>2.3</u>
	181	434	225	226	4	0.52	0.01	0.53	2.4

* Fish per hour is for both complete and incomplete trips. Completed trips accounted for 66 total angler hours or 15% of total effort. Completed trips accounted for 97 fish harvested or 42% of the recorded harvest. Catch rate for completed trips was 1.47 fish per hour.

harvest was comprised of coho salmon from the stocking of 55,549 fish in 1978. A sample of 81 coho salmon entering the winter harvest ranged from 225-348 mm and had a mean length of 298 mm.

Four rainbow trout observed in the harvest ranged from 468-602 mm in length and from 1.6-3.5 kg (3.5-7.8 lbs) in weight. One was Age III, two were Age IV and one was Age V.

A stratified random sampling schedule was used to determine angling pressure from May 10 through August 31, 1980. The schedule involved four hourly counts on 1 weekday and 1 weekend day or holiday per week. The hours covered prior to July 31 were 6 a.m. to 12 midnight. Because of fewer hours of daylight after July 31 the hours covered were 6 a.m. to 7 p.m.

Sampling intensity was reduced by about two-thirds from previous years because of manpower limitations and the close agreement with results from postal surveys reported by Mills (1979, 1980 and 1981) (shown in Table 9).

The pressure estimate for the 1980 summer season was 27,012 angler hours (Table 10), a 12% increase in pressure over the 24,024 angler hours estimated in 1979 (Peckham, 1979).

Anglers returning to the boat launch ramp during the sampling period were interviewed to determine catch success for completed trips. During the season a total of 194 anglers contacted had fished 607 hours and kept 565 coho salmon and only two rainbow trout. The catch rate for fish kept was 0.93 coho salmon per hour and 0.003 rainbow trout per hour (Table 11). The catch rate for coho salmon was down from 1.39 and 1.03 fish/hr recorded in 1979 and 1978, respectively. Shore anglers accounted for less than 2% of the total effort and less than 0.2% of the total catch.

The expanded total harvest based on pressure and catch rate estimates was 25,121 coho salmon and 81 rainbow trout.

The coho salmon harvested in spring and early summer were primarily Age III fish, ranging in length from 305-437 mm, with a mean of 373 mm. Age I coho salmon were being caught and released in late May and June, but because of their small size were not kept in any quantity by anglers until July. Many coho salmon, usually those less than about 175 mm, were still being released in July and August. Mean lengths of Age I coho salmon caught and kept each month were 183 mm and 200 mm, respectively. The mean length of coho salmon sampled from the harvest during the season including all age classes was 213 mm.

Only one Age I fish (215 mm in length) from the 1979 stocking of 32,858 Swanson rainbow trout was recorded in the harvest, although they were captured in fyke nets and gill nets during the summer. Size and capture rates discussed earlier are presented in Tables 5 and 6.

Table 9. A comparison of on-site pressure and harvest estimates with postal survey* results, Quartz Lake, 1977-1979.

Year	On-Site Estimates			Postal Survey		
	Man- ^{**} Days	RT	SS	Man- Days	RT	SS
1977	8,884	2,488	0	6,317	2,634	0
1978	5,704	639	16,449	6,845	512	14,892
1979	8,580	240	33,393	10,150	273	34,787
1980	9,647	81	25,121			

* The postal survey was conducted by Michael G. Mills, Biometrician, Sport Fish Division, Anchorage. The postal survey covers the period from Jan 1 to Sept. 30, while the on-site estimates generally cover the period from mid May through Labor Day weekend.

** Man-days were calculated by dividing total angler hour estimates by the mean number of hours per trip (2.8) for 1977-1980.

Table 10. Quartz Lake angler pressure estimates, May 10 - August 31, 1980.

Month	<u>Weekdays</u>		<u>Weekends and Holidays</u>		Total
	Estimated Angler Hours	Percent of Total	Estimated Angler Hours	Percent of Total	
May 10 - July 31 (6 a.m. to midnight)	12,337	51	11,708	49	24,045
Aug. 1 - Aug. 31 (6 a.m. to 7 p.m.)	853	29	2,114	71	2,967
Totals	13,190	49	13,822	51	27,012

Table 11. Quartz Lake creel census summary*, May 10 to August 30, 1980.

Month	Anglers	Total Hrs. Fished	Total SS Kept	Total SS Caught	Total RT Kept	Fish per hour**			Hours per Trip
						SS	RT	Total	
May	9	16	1	1	1	0.06	0.06	0.12	1.7
June	25	93	22	88	0	0.24	0.00	0.24	3.7
July	100	307	244	599	0	0.79	0.00	0.79	3.1
Aug	<u>60</u>	<u>191</u>	<u>298</u>	<u>383</u>	<u>1</u>	<u>1.56</u>	<u>0.01</u>	<u>1.57</u>	<u>3.2</u>
Totals	194	607	565	1,071	2	0.93	0.003	0.93	3.1

* All data presented is for completed trips. Shore fishermen accounted for less than 2% of the total effort and less than 0.2% of the total catch.

** Fish per hour is only for fish kept.

George Lake:

George Lake, located about 40 miles east of Delta Junction, continues to be the most heavily utilized northern pike fishery in the Delta area. Civilian and military anglers from the Delta and Fairbanks area are the principal users.

The Tanana River isolates this 4,500 acre lake from the Alaska Highway, making it accessible only by boat or float plane. Float plane use is presently light. Fishing pressure is heaviest from breakup (usually near the first of June) until mid-July.

In recent years about 90% of the people fishing George Lake launched their own boats at George Lake Lodge near mile 1385 Alaska Highway or were transported by the lodge owner. Most other anglers launched at a landing about 15 miles downstream on the Tanana River.

Due to the death of the lodge owner prior to the 1980 season, no transporting service to the lake was available, however the boat launching ramp did remain open. An angler questionnaire distributed from the lodge from 1976-1979 was not utilized in 1980.

A comparison of on-site estimates of effort and catch from 1976-1979 with postal survey results by Mills (1979, 1980 and 1981) is shown in Table 12. In 1979 the postal survey effort estimate was 30% greater and the catch estimate for northern pike was 34% greater than on-site estimates. Postal survey harvest estimates of pike were about 36% less in 1978 and 69% less in 1977.

On May 31, 1980 anglers were contacted to determine catch success and size of fish harvested. Twenty-two anglers had fished 51.5 hours and kept 47 northern pike, for a catch rate of 0.91 fish/hr. Length range was 394-940 mm with a mean of 585 mm.

George Lake was checked on 1 weekend day and 1 week day in August (9th and 27th). A party of three contacted on August 9th were the only anglers on the lake and had just started fishing. No anglers were noted on the 27th.

Goodpaster River Studies

Population Estimates:

Population levels of Arctic grayling were determined for two study sections in the lower Goodpaster River during late June. During previous sampling (Tack, 1974 and 1975), grayling population estimates were made for each of three areas in the entire 185 km (115 mi) of the Goodpaster River. Population estimates from 1975 through 1978 (Peckham, 1976, 1977, 1978 and 1979) and again in this study are limited to two study sections, 4.8 km (3 mi) each in length, located in the lower 53 km (33 mi). The fish were captured using electrofishing gear, as in the previous work. Two passes were made through each section to capture fish for marking. Grayling greater than 150 mm were given a lower caudal fin clip. One day was allowed for

Table 12. A comparison of on-site pressure and harvest of northern pike estimates with postal survey results, George Lake, 1976-1979.

Year	<u>On-Site Estimates</u>		<u>Postal Survey</u>	
	Man Days	NP	Man Days	NP
1976	748	1,700	No estimate	
1977	840	2,072	854	1,227
1978	1,036	1,890	1,271	1,392
1979	673	1,558	903	2,018

random mixing of marked fish prior to a final run to examine for recaptures.

The Petersen estimates for grayling in Section 2(4.8-9.6 km, 3-6 mi) and Section 6(24-28.8 km, 15-18 mi) are 529 grayling per km and 495 grayling per km, respectively (Table 13). The estimate for the two study sections combined was 512 grayling per km (819 grayling per mi). The combined estimate is the highest recorded in the 7 years of study. Higher numbers of grayling than previously recorded were also found in the Richardson Clearwater and Delta Clearwater Rivers in 1980 using similar sampling methods (Ridder, 1981). A comparison of population estimates for the lower Goodpaster River from 1973 to 1980 is presented in Table 14.

Age and Length Frequency Data:

Age determinations by scale analysis were made from a random subsample of an equal number of grayling from each index section of the Goodpaster River. Age Class IV was the predominant age group, comprising 42% of the total subsample (Table 15). Age Class IV was also the predominant age group in 1978, comprising 56% of the subsample. No sampling was done in these index sections in 1979.

The pattern of Age Class IV being predominant on even years and Age Class III predominant on odd years has occurred each year since sampling was initiated in 1973. This pattern was also evident in grayling samples collected in Clear Creek, where in 1979 Age III grayling were predominant, comprising 43% of the sample (n=39) and in 1980 Age IV predominated, with 58% of the sample (n=52).

The pattern does not occur on the larger spring-fed systems (Richardson Clearwater and Delta Clearwater Rivers) where, unlike the lower Goodpaster River and Clear Creek, older age classes usually prevail. However, at Mile One Slough on the Delta Clearwater River, where grayling captured in the early spring migration into the system are predominantly juvenile fish, the pattern was again manifest. In 1977 and 1979 Age III grayling prevailed, comprising 61% and 45% of the sample, respectively. In 1978, Age IV grayling were most abundant with 44% of the sample (Ridder, 1980).

The 1980 subsample (n=96), which is comprised of an equal number of grayling from each section, contained no grayling older than Age V. The same was true in 1978. In the 3 years prior to 1978, grayling in age classes greater than Age V comprised 6 to 20% of the total. The lower 53 km (33 mi) of the Goodpaster River is characteristically a rearing area for small grayling, with the upper reaches of the river being inhabited by larger grayling (Tack, 1974).

As in past years the number of grayling captured in Age Classes I and II may not accurately depict their true abundance. Fish in the smaller size groups were commonly observed but are less effectively stunned by the boat shocker, and therefore are more difficult to net.

Table 13. Population estimates for Arctic grayling (greater than 150 mm)
in two sections of the Goodpaster River, June 24-27, 1980.

Section	Marked Fish in Population (m)	Fish Examined (c)	Recaps (r)	Petersen Estimate(n)*	GR/km	GR/mi
2 (km 4.8-9.6)	231	153	13	2,541	529	847
6 (km 24-28.8)	337	213	31	2,374	495	791
2 and 6 combined	568	366	44	4,915	512	819

$$* N = \frac{(m) (c+1)}{r+1}$$

Table 14. A comparison of population estimates for Arctic grayling (greater than 150 mm) in the lower Goodpaster River for 1973-1980.

Year	Method of Estimate	Length of Area		Population Estimate	
		km	mi	GR/km	GR/mi
1973	Schnabel	53.0	33	480	770
1974	Petersen	53.0	33	201	323
1975	Petersen	9.6	6*	475	760
1976	Petersen	9.6	6	351	563
1977	Petersen	9.6	6	377	604
1978	Petersen	9.6	6	468	749
1980	Petersen	9.6	6	512	819

* The 6 miles for which the estimates were made in 1975 through 1980 include two index areas of 3 miles each (miles 3-6 and miles 15-18). No estimate was made in 1979.

Table 15. Age frequency and length of Arctic grayling captured in two sections (Section 2 and 6) of the Goodpaster River, June, 1980.

Age Class	Number	Percent	Length (mm)	
			Range	Mean
I	5	5	97-115	105
II	26	27	132-184	156
III	19	20	175-240	202
IV	40	42	188-244	220
V	6	6	248-279	260
	<u>96</u>			

The length frequency of 713 grayling captured in the two study sections is shown in Table 16. The most abundant size group were grayling having a length range of 210-229 mm, which accounted for 27.8% of the total sample. Only 12 grayling or 1.6% of the total sample exceeded 270 mm in length. The mean length of the entire sample was 195 mm.

Five young-of-the-year grayling fry were collected on June 25 with a 1/4 in mesh seine at Mile 3. They had a length range of 43-48 mm and a mean of 45 mm. Although sometimes observed while electrofishing, fry are seldom stunned sufficiently to be netted or slip through the larger size mesh used on the dip nets.

Capture Rate:

The capture rate of the fish species collected during electrofishing was recorded to provide an index of their relative abundance. The index may be biased because grayling was the target species and more effort was directed toward their capture; however, the data are intended to reveal trends in population abundance when compared with data from prior years.

The relative abundance of grayling, round whitefish and longnose suckers, as revealed by fish captured per hour, was 159, 42 and 14, respectively. Grayling comprised 74% of the three species collected. As shown in Table 17, the 1980 capture rates compare closely with the 5-year mean from 1973 to 1978.

Burbot and northern pike were captured at rates of 3.3 and 1.3 fish per hour, respectively. Other fish species captured at rates of less than one fish per hour included Arctic lamprey, coho salmon and slimy sculpin.

Remote Stream Survey

A preliminary fishery survey was conducted on the Ladue River from June 10 to 13, 1980 in cooperation with the Bureau of Land Management. The river is within a proposed utility corridor for the extension of the Alaska Railroad from Eielson Air Force Base to the Canadian Border.

The Ladue River, a tributary of the White River, originates east of Tetlin Junction and flows easterly a distance of about 60 air miles through a relatively narrow valley before reaching the Canadian border. There are no roads into the area nor air strips or gravel bars large enough for landing a plane. Access is limited to one or two all-terrain vehicle trails crossing the upper portions of the drainage. Two cabins, one near the confluence of the South Fork and the other on a tributary about 10 miles upstream from the Canadian border, are apparently used in the winter by trappers. Access for conducting the survey was by helicopter.

The stream is typically slow and meandering with frequent riffles connected by long sluggish pools. Bottom type ranges from sand and silt in slow sections to gravel and cobble in riffle areas. A wide range of flows were apparent, as evidenced by logs and debris 6 feet or more above water levels observed during the survey. The water had a slight tannic acid stain.

Table 16. Length frequency of Arctic grayling captured in two sections of the Goodpaster River, June, 1980.

Length Range (mm)	Section 2 (Miles 3-6)		Section 6 (Miles 15-18)		Sections 2 and 6 Combined	
	Number	Percent	Number	Percent	Number	Percent
90-109	4	1.5	2	0.4	6	0.9
110-129	5	1.8	5	1.1	10	1.4
130-149	31	11.4	66	15.0	97	13.6
150-169	63	23.1	59	13.4	122	17.1
170-189	19	6.9	18	4.1	37	5.2
190-209	33	12.1	99	22.5	132	18.5
210-229	74	27.1	124	28.2	198	27.8
230-249	32	11.7	40	9.1	72	10.1
250-269	6	2.2	21	4.8	27	3.8
270-289	4	1.4	6	1.4	10	1.4
290-309	1	0.4	0		1	.1
310-329	<u>1</u>	<u>0.4</u>	<u>0</u>	<u>—</u>	<u>1</u>	<u>.1</u>
	273		440		713	
<u>Section</u>	<u>Mean Length (mm)</u>					
2	193					
6	196					
Combined	195					

Table 17. A comparison of fish capture rates using a boat mounted shocker, Goodpaster River, 1973-1980.

Species	1973, 1975, 1976, 1977, 1978				1980	
	Fish/Hr.		Percent		Fish/Hr.	Percent
	Range	Mean	Range	Mean		
Grayling	78-223	156	61-81	72	159	74
Round Whitefish	31-89	48	16-26	22	42	20
Suckers	2-28	<u>14</u> 218	1-15	7	<u>14</u> 215	6

The uppermost section surveyed, approximately 6 miles above the South Fork, had an average width of 15 ft and average depth of 1 ft, with pools up to 3 ft deep.

At a sampling site one-half mile above the South Fork, flow was measured at 21 cfs. average width and depth were 23 ft and 0.7 ft, respectively. The furthestmost downstream point sampled was 10 miles above the Canadian border. At this site average width was 52 ft, average depth 0.9 ft and flow was 77 cfs. Water chemistry measurements were as follows: pH 7.0, total alkalinity 68 ppm, total hardness - 68 ppm and dissolved oxygen -11.0 ppm. Fish sampling tools used included gill nets, seines, back-pack shocker, minnow traps, fyke nets and sport fishing gear. Fish population density and species diversity is relatively low as shown by sampling results. Four species of fish, Arctic grayling, longnose sucker, northern pike and round whitefish, were captured. Size and relative abundance are shown in Table 18. Included in the sampling results were 16 grayling captured in an overnight gill net set in an oxbow lake approximately 18 miles upstream from the Canadian border. All six northern pike, seven longnose suckers, three round whitefish and five grayling were captured in another gill net set in a deep pool in the main river at the sample site 10 miles upstream from the Canadian border.

Age composition and lengths for each age group of 49 grayling sampled are presented in Table 19. Age Class V was predominant, comprising 29% of the sample. Age classes IV and VI each comprised 20% of the catch, and Age VII fish comprised 15%, thus the older age classes represented 84% of the total grayling sample. Growth of the various age classes of grayling was generally comparable with that of Goodpaster River grayling (Table 15).

Table 18. Summary of fish captured in the Ladue River, June, 1980.

Species	Number	Length (mm)	
		Range	Mean
Grayling	54	125-366	256
Longnose sucker	9	350-420	386
Northern pike	6	400-555	467
Round whitefish	4	255-378	314

Table 19. Age frequency and length of Arctic grayling, Ladue River,
June, 1980.

Age Class	Number	Percent	Length (mm)	
			Range	Mean
II	5	10	125-156	138
III	3	6	187-212	200
IV	10	20	220-271	238
V	14	29	220-295	269
VI	10	20	265-320	296
VII	<u>7</u>	15	<u>305-366</u>	<u>334</u>
	49		125-366	260

LITERATURE CITED

- Havens, A. C. 1979. Population studies of game fish and evaluation of managed lakes in the upper Cook Inlet drainage. Alaska Dept. of Fish and Game. Federal Aid in Fish Restoration, Annual Report of Progress, 1979-1979, Project F-9-11, 20(G-III-D): 1-23.
- Mills, M. J. 1979. Alaska Statewide Sport Fish Harvest Studies. Alaska Dept. of Fish and Game. Federal Aid in Fish Restoration, Annual Report of Progress, 1978-1979, Project F-9-11, 20(SW-I-A): 1-112.
- _____. 1980. Alaska Statewide Sport Fish Harvest Studies. Alaska Dept. of Fish and Game. Federal Aid in Fish Restoration, Annual Report of Progress, 1979-1980, Project F-9-12, 21(SW-I-A): 1-65.
- _____. 1981. Alaska Statewide Sport Fish Harvest Studies. Alaska Dept. of Fish and Game. Federal Aid in Fish Restoration, Annual Report of Progress, 1980-1981, Project F-9-13, 22(SW-I-A): 1- .
- Peckham, R. D. 1976. Evaluation of Interior Alaska waters and sport fish with emphasis on managed water - Delta District. Alaska Dept. of Fish and Game. Federal Aid in Fish Restoration, Annual Report of Progress, 1975-1976, Project F-9-8, 17(G-III-I): 31-50.
- _____. 1977. Evaluation of Interior Alaska waters and sport fish with emphasis on managed water - Delta District. Alaska Dept. of Fish and Game. Federal Aid in Fish Restoration, Annual Report of Progress, 1976-1977, Project F-9-9, 18(G-III-I): 88-105.
- _____. 1978. Evaluation of Interior Alaska waters and sport fish with emphasis on managed water - Delta District. Alaska Dept. of Fish and Game. Federal Aid in Fish Restoration, Annual Report of Progress, 1977-1978, Project F-9-10, 19(G-III-I): 63-82.
- _____. 1979. Evaluation of Interior Alaska waters and sport fish with emphasis on managed water - Delta District. Alaska Dept. of Fish and Game. Federal Aid in Fish Restoration, Annual Report of Progress, 1978-1979, Project F-9-11, 20(G-III-I): 87-114.
- Ricker, W. E. 1958. Handbook of computations for biological statistics of fish populations. Fisheries Research Board of Canada, Narrain, B.C., Canada, Bulletin 119.
- Ridder, W. P. 1980. A study of a typical spring-fed stream of Interior Alaska. Alaska Dept. of Fish and Game. Federal Aid in Fish Restoration. Annual Report of Progress, 1979-1980, Project F-9-12, 21(G-III-G): 43-93

Ridder, W. P. 1981. A study of a typical spring-fed stream of Interior Alaska. Alaska Dept. of Fish and Game. Federal Aid in Fish Restoration. Annual Report of Progress, 1980-1981, Project F-9-13, 22(G-III-G):

Tack, S. L. 1974. Distribution, abundance, and natural history of Arctic grayling in the Tanana River drainage. Alaska Dept. of Fish and Game. Federal Aid in Fish Restoration, Annual Report of Progress, 1973-1975. Project F-9-7, 16:(R-I): 52.

_____. 1975. Distribution, abundance, and natural history of Arctic grayling in the Tanana River drainage. Alaska Dept. of Fish and Game. Federal Aid in Fish Restoration, Annual Report of Progress 1974-1975, Project F-9-7, 16(R-I): 35.

Van Hulle, F. D. 1968. Investigations of the fish populations in the Chena River. Alaska Dept. of Fish and Game. Federal Aid in Fish Restoration, Annual Report of Progress, 1967-1968, Project F-5-R-9, 9: 287-304.

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